

**REMARKS**

Favorable reconsideration of this application, in light of the preceding amendments and following remarks, is respectfully requested.

Claims 1, 2 and 11 are pending in this application. No claims are amended, added or cancelled. Claims 1 and 11 are the independent claims.

*Furthermore, upon review of the enclosed Amendment, Applicants respectfully request that the Examiner contact the undersigned to discuss the Applicants' reasoning and/or possible claim amendments that may place the application in condition for allowance.*

**Example Embodiments of the Present Application**

Independent claims 1 and 11 recite "an organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag and a neutral metallic ligand having photosensitivity, organometallic compound (II) of Formula 2 containing at least one of Au, Pd and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al". Example non-limiting embodiments of this feature are discussed throughout the instant specification.

Example embodiments relate to forming a metal alloy pattern using organometallic compounds which are made by adding organic compounds into metals (Ag, Au, Pd and Ru). Example embodiments provide organometallic compounds to overcome relatively low adhesion of the metals which may be an issue if the metals are used alone.

In example embodiments, the method of forming a metal alloy pattern may include relatively simple steps and example embodiments could be applied to forming a metal alloy pattern without CVD process which should be carried out under relatively high temperatures and/or relatively high pressures.

A non-limiting example embodiment of the organometallic composition is explained in paragraph [0021] of the present specification. The sensitivity to light that is a characteristic of the organic ligand of Formula 1 allows the organic ligand to become readily dissociated from the central metal. In addition, the ternary organometallic composition comprising the organometallic compounds of Formula 2 and 3 need not be photosensitive and are mixed uniformly within the prescribed range in the composition.

**Rejections under 35 U.S.C. § 103**

***Furuya in view of Welch et al.***

Claims 1, 2 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent No. 2001-221908 to Furuya Kinzoku KK (“Furuya”) in view of U.S. Patent No. 6,184,403 to Welch et al. (“Welch”). Applicants respectfully traverse this rejection for the reasons detailed below.

In the Office Action, the Examiner stated that Furuya discloses an organic metallic composition comprising the claimed metal complexes, wherein the metallic complexes include Ag, and Au and one of Cu or Ti or Ta, and that the metals in the metallic complex is further complexed with organic compounds; that the difference between the claims and Furuya is that Furuya does not disclose that the metal complexed organic compound, i.e., the organometallic compound has the claimed neutral ligand with photosensitivity; that Furuya does not disclose that the organic-metal complex includes the anion recited in claims 1 and 11; that Furuya does not disclose that the organic film complexed with the metal includes the neutral ligand recited in claim 2; that Welch discloses that the organo metallic compounds include a neutral metallic ligand such as NR<sup>9</sup>, wherein R<sup>9</sup> comprises an alkyl group, and a nitro or carboxylate anion, and discloses a neutral ligand that has the claimed number of carbon atoms, and a donor such as

nitrogen or sulfur and is therefore inherently sensitive to light exposure; that Welch discloses that the composition can be patterned (via decomposition or conversion to metal oxide) via exposure to a laser at suitable wavelengths, i.e., the composition is photosensitive; and that, therefore, it would be obvious to a skilled artisan to modify Furuya by employing the organic ligands and anions suggested by Welch in the organo-metal complex because Welch discloses that the addition of the claimed ligands in the metal complex induces higher volatility in the organo metallic compound, and enable stability of the organo metal complex at the sublimation point, and retains desirable processing features. Applicants respectfully disagree.

Furuya and/or Welch, as relied upon by the Examiner, fails to suggest an organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag and a neutral metallic ligand having photosensitivity, organometallic compound (II) of Formula 2 containing at least one of Au, Pd and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al as recited in independent claims 1 and 11.

The outstanding Office Action acknowledges that Furuya fails to disclose “the organic compound is the claimed neutral ligand and the organic-metal complex includes the anion recited in independent claims 1 and 11” and relies on the teachings of Welch for these features of claims 1 and 11.

In addition to the above-identified deficiencies of Furuya, Applicants respectfully submit that Furuya does not disclose an organic metallic composition as the Examiner claims, but discloses only alloys produced as a film on a substrate by sputtering metals, which is different from the organometallic compound disclosed in independent claims 1 and 11. Also, the starting materials and process in Furuya are different from those disclosed in independent claims 1 and 11. Furthermore, organometallic compounds are normally named as substituted metals, e.g., alkyl metal or alkyl metal halide. Examples include  $\text{CH}_3\text{Li}$  (methyl lithium) and  $\text{CH}_3\text{MgBr}$

(methyl magnesium bromide). Referring to [0032] and the figures 1 and 2 in Furuya, the layer (3) is formed on the organic base film (8). Therefore, the layer (3) and organic base film (8) are formed as different layers, which are just bordered, and so the organic compound of the organic base film (8) is not substituted for the metals of the layer (8). Thus, the layers (3, 8) do not form the organometallic compounds with each other.

In addition, independent claims 1 and 11 disclose an organic ligand of Formula 1 that is photosensitive, which allows the ligand to become readily dissociated from the central metal. Furuya discloses a reflection film consisting of AgPdX, AgAuX, wherein X is Cu or Ti, and not an organometallic composition comprising the organometallic compounds in Formulas 1, 2 and 3 nor a photosensitive organic ligand as disclosed in independent claims 1 and 11.

In regards to Welch, the Examiner states that Welch includes a neutral metallic ligand such as  $NR^9$ , wherein  $R^9$  comprises an alkyl group, and a nitro or carboxylate anion. Although  $NR^9$  could be similar in chemical structure to the neutral metallic ligand L of example embodiments, Applicants respectfully submit that  $NR^9$  is not a neutral metallic ligand, but a replacement material for oxygen in metal diketonate complexes of Welch. Furthermore, there is neither a disclosure nor a suggestion in Welch that  $NR^9$  could be a neutral metallic ligand, e.g., no discussion of technical advantages of  $NR^9$  and examples using  $NR^9$  as the neutral metallic ligand in Welch.

In addition, Applicants respectfully submit that CVD precursors having increased volatility and chemical stability in Welch can be obtained by including the organometalloid compound having the structure of formula I, which is used as a ligand. The neutral metallic ligand L of example embodiments is different from the ligand expressed as the organometalloid compound of Welch in that the neutral metallic ligand L includes neither metalloid, e.g., Si, Ge, Sn, and Pb, nor diketonnate bone.

As admitted by the Examiner herself in the Response to Arguments section, Welch describes the photolytic nature of the **metal complex**, but not the ligand itself as in claims 1 and 11. Furthermore, volatility of the ligand of independent claims 1 and 11 is due to photosensitivity, but Welch teaches volatility of CVD precursors including a neutral metallic ligand. The organometalloid compound of Welch is made for CVD precursors, whereas example embodiments do not require a CVD process. The organometalloid compounds having the structure of formula I based on  $\beta$ -diketonates are bidentate ligands in Welch allowing for more stable metal complexes than monodentate ligands could do, e.g., a chelate effect. As a result, the organometalloid compounds of Welch are much less sensitive to light than the organometallic compounds of example embodiments. In other words, the metal complexes in Welch could not be decomposed although they are exposed to light similar to example embodiments. Thus, there is no specific example in Welch regarding photolytic decomposition in Welch.

Finally, a ligand is either an atom, ion, or molecule that bonds to a central metal, generally involving formal donation of one or more of its electrons. **O, S, and NR<sup>9</sup> do not form coordinate covalent bonds with a carbon, for example, they do not donate one or more of their electrons to the carbon, but rather form a double bond with the carbon.** Therefore, Applicants submit that NR<sup>9</sup> is not a ligand but a replacement material for oxygen in metal diketonate complexes of Welch. Applicants also submit that decomposition of the metal complex releases the metal from an organic metal compound (ML<sub>n</sub>pD), for example, the metal and the ligand L are separated from ML<sub>n</sub>pD, but the NR<sup>9</sup> should not be released or separated from the organic metal compound (ML<sub>n</sub>pD) by plasma or laser.

Because neither Furuya nor Welch teaches an organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag and a neutral metallic ligand having photosensitivity, organometallic compound (II) of Formula 2 containing at least one of Au, Pd

and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al as recited in independent claims 1 and 11, the alleged combination of Furuya and Welch also cannot teach “an organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag and a neutral metallic ligand having photosensitivity, organometallic compound (II) of Formula 2 containing at least one of Au, Pd and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al” as recited in independent claims 1 and 11.

With respect to the proposed combination of Furuya and Welch, Applicants respectfully submit that the combination is improper for at least the following reasons.

Furuya is directed to a reflector (which is a technical field different from example embodiments), whereas the teachings of Welch describe MOCVD precursors. Accordingly, Applicants respectfully submit there is insufficient evidence in the record for modifying the reflector of Furuya to incorporate the MOCVD precursors of Welch. Additionally, neither Furuya nor Welch recognize the solution thereto regarding the composition ratio of the organometallic compounds of Formula 1, 2 and 3.

Further, Applicants respectfully submit that an attempt to bring in the isolated teachings of the MOCVD precursors of Welch into the reflector of Furuya would amount to improperly picking and choosing from the different references without regard for the teachings of the references as a whole.<sup>1</sup>

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<sup>1</sup> See *In re Ehrreich* 590 F2d 902, 200 USPQ 504 (CCPA, 1979) (stating that patentability must be addressed "in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the sum of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art," and that one "must consider the entirety of the disclosure made by the references, and avoid combining them indiscriminately.")

The Applicants maintain, therefore, that the Action does not present the required “convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references,” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985), and that this rejection may not be properly maintained absent such reasoning.

The Applicants, therefore, respectfully request that the rejection to Claims 1, 2 and 11 under 35 U.S.C. § 103(a) be withdrawn.

Claim 2, dependent on independent claim 1, is patentable for the reasons stated above with respect to claim 1 as well as for its own merits.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection to independent claim 1 and all claims dependent thereon.

### **CONCLUSION**

In view of the above remarks and amendments, the Applicants respectfully submit that each of the pending objections and rejections has been addressed and overcome, placing the present application in condition for allowance. A notice to that effect is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to contact the undersigned.


Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Erin G. Hoffman, Reg. No. 57,752, at the telephone number of the undersigned below.

*As discussed above, Applicants respectfully request that the Examiner contact the undersigned to discuss the Applicants’ reasoning and/or possible claim amendments that may place the application in condition for allowance.*

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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